

1. System comprising bar-elements (4,125,126) joined or joinable to form a truss
5 (5), and connecting elements (1,14,21,34,38,52) inserted or insertable between
these bar-elements (4,125,126) at all such joint places, where two or more bar-
elements meet whose longitudinal axes are not coaxial to each other, whereby

a) the bar-elements (4,125,126) consist of at least one segment of a
material from high-growing plants each, and

10 b) the connecting elements (1,14,21,34,38,52) consist of a rigid,
regenerative material,

characterised in that

c) at least one end of a bar-element (4,125,126), a connecting element
15 (1,14,21,34,38,52) which is to be mounted to said bar-element, and/or
the end of a further bar-element (4,125,126) which is to be connected,
are treated such that they exhibit surfaces running along well-defined
geometrical bodies at least in selected areas,

d) such that at the joint between a bar-element (4,125,126) and a
20 connecting element or a further bar-element
(1,14,21,34,38;4,125,126), each of both bodies
(4,125,126;1,14,21,34,38,52) exhibits at least in a selected area a
surface which runs along the surface (11;76) generated by a cylinder,
cone, prism or a pyramid, as well as at least in another selected area a
surface (11;75) which runs along a hollow cylinder, hollow cone, hollow
25 prism and/or a hollow pyramid respectively,

e) which surfaces permit an assembly by plugging together with closely
adjoining surfaces which are complementary to each other and
suitable for locking by clamping and/or glueing like a fit.

30 2. System according to claim 1, characterised in that the joint between a bar-
element (4,125,126) and a connecting element or a further bar-element
(1,14,21,34,38;4,125,126) is designed as a plug-connection (30).

3. System according to claim 1 or 2, characterised in that the joint between a bar-element (4,125,126) and a connecting element or a further bar-element (1,14,21,34,38;4,125,126) is designed as a clamping (21,34) or glueing (1,14,38) connection.

4. System according to claim 3, characterised in that for mounting a bar-element (4,125,126) by clamping, a core (23) at the connecting element or at the further bar-element (1,14,21,34,38;4,125,126) is designed to be spreadable and therefore said core can be pressed against the inside (76) of the bar-element (4,125,126).

5. System according to claim 4, characterised in that an element (31) widening conically or like the frustum of a pyramid, is pushed or pulled into an inner, preferably centric cut-out (13) of said core (23), for spreading the core (23).

6. System according to claim 5, characterised in that the connecting element or the further bar-element (1,14,21,34,38;4,125,126) exhibits a cut-out (13) penetrating the core (23) in which the shaft of a screw (27), of a bolt or the like can be inserted to pull an element (31) with widening cross-section into the core (23).

7. System according to one of the claims 4 to 6 characterised in that the connecting element (34) exhibits an annular shape (35), so that the cut-outs (13) for the insertion of a screw-like spreading element (27,31) can extend up to the inside (37) of the ring (35), in order to apply a threaded element or other clamping element at this location.

8. System according to one of the previous claims, characterised in that the connecting element (1,52) exhibits a discoidal shape, e.g. with a circular or ring-shaped, or a triangular, quadrilateral or hexagonal base (7,53).

9. System according to one of the previous claims, characterised in that one connecting element (1,14,21,34,38,52) exhibits at least one surface area of concave shape, in particular a shape which approximately corresponds to a

part of the lateral surface of a hollow cylinder, for connecting to the shaft of a bar-element (4,125,126).

10. System according to one of the previous claims, characterised in that at least one bar-element (4,125,126) exhibits a shaft milled to a round shape at its outer surface.

11. System according to one of the previous claims, characterised in that a bar-element (4,125,126), which is to be inserted between two connecting elements (1,14,21,34,38,52), exhibits a principally similar structure at both of its ends, i.e. at both ends the surfaces (11;76) running along a cylinder, cone, prism or pyramid are arranged either within or without, respectively, of the surfaces (11;75), which run along a hollow cylinder, hollow cone, hollow prism and/or hollow pyramid in a selected area.

12. System according to one of the previous claims, characterised in that a bar-element (4,125,126), which is to be inserted between two bar-elements (4,125,126), exhibits a principally different structure at both of its ends, i.e. at one end the surface (11;76) running along a cylinder, cone, prism or pyramid is arranged within the surface (11;75), which runs along a hollow cylinder, hollow cone, hollow prism and/or hollow pyramid in a selected area, at the other end this is the other way round.

13. System according to one of the previous claims, characterised in that the bar-elements (4,125,126) consist of tubes.

14. Process to produce a truss (5) from bar-elements (4,125,126), which are to be joined, and from connecting elements (1,14,21,34,38,52), which are to be placed between these bar-elements at all such joint places, where two or more bar-elements meet whose longitudinal axes are not coaxial to each other, whereby

- a) the rod-like -elements (4,125,126) are made from at least one segment of a material from high-growing plants each, as well as

- b) the connecting elements (1,14,21,34,38,52) consist of a rigid, regenerative material,

characterised in that

- 5 c) at least one end of a bar-element (4,125,126), a connecting element (1,14,21,34,38,52) which is to be mounted to said bar-element, and/or the end of a further bar-element (4,125,126) which is to be connected, are treated such that they exhibit surfaces running along well-defined geometrical bodies at least in selected areas,
- 10 d) such that at the joint between a bar-element (4,125,126) and a connecting element or a further bar-element (1,14,21,34,38,4,125,126), each of both element bodies (4,125,126;1,14,21,34,38,52) exhibits at least in a selected area a surface which runs along the surface (11;76) generated by a cylinder, cone, prism or a pyramid, as well as at least in another selected area a
- 15 surface (11;75) which runs along a hollow cylinder, hollow cone, hollow prism and or hollow pyramid respectively,
- e) and that surfaces (11;75) processed in such a way are assembled by plugging them together with closely adjoining surfaces which are complementary to each other and suitable for locking by clamping
- 20 and/or glueing like a fit.

15. Process according to claim 14, characterised in that the bodies and/or the surfaces of the parts (4,125,126;1,14,21,34,38,52) which are to be connected are processed by ablating, particularly by cutting.

- 25 16. Process according to claim 14 or 15, characterised in that both ends (73) of a bar-element (4,125,126) are processed in such a way, that the (longitudinal) symmetry axes of the processed areas (75;76) are in line with each other.

- 30 17. Process according to one of the claims 14 through 16, characterised in that slots (24), which are preferably parallel to the longitudinal axis of the concerned plug-connection (3), are placed in an area, which adjoins the lateral surface (11) of a connecting element or a further bar-element (1,14,21,34,38,52;4), in

order to facilitate a radial spring-like movement of (areas 25 of) the concerned generated surface (11).

- 5 18. Process according to claim 17, characterised in that a spreading element (31) is inserted in a bore (13), which is parallel or coaxial to the longitudinal axis of a plug-connection (3), in order to permit pressure being exerted in the direction of (areas 25 of) the generated surface (75) at the end of a bar-element (4) which is to be connected.
- 10 19. Process according to one of the claims 14 to 18, characterised in that the bar-elements (4,125,126) are glued or clamped to the connecting elements or further bar-elements (1,14,21,34,38,52;4,125,126) after plugging (30) them together.
- 15 20. Process according to one of the claims 14 to 19, characterised in that connecting elements (38) are used as end pieces along the longitudinal edge of the truss (5), which are connectable to a foundation (41), a ceiling, a roof or the like.
- 20 21. Process according to one of the claims 14 to 20, characterised in that a panelling or the like is attached at the connecting elements (1,14,21,34,38,52) of the truss (5).
- 25 22. Process according to one of the claims 14 through 21, characterised in that bamboo culms (4) are used as bar-elements, whose inner and/or outer lateral surfaces (75,76) at the culms' ends (73) are processed.
- 30 23. Process according to claim 22, characterised in that the lateral surface(s) (75,76) of the end (73) of a bamboo culm are processed in such a way, that the wall-thickness of the culm (4) is equal to or less than a predetermined wall-thickness.

24. Process according to one of the claims 22 through 23, characterised in that potentially present diaphragms (nodes) in the bamboo culm (4) are pierced or made passable otherwise.

5 25. Process according to one of the claims 22 through 24, characterised in that holes (13) are drilled into a connecting element (1,14,21,34,38,52), which lead into a surface area (12) covered by the face-side of an attached bamboo culm (4), in such a way, that said holes join within the connecting element (1,14,21,34,38,52) in order to obtain a link between the cavities of the attached
10 bamboo-culms (4).

26. Process according to claim 25, characterised in that, during the creation of lateral surfaces (75,76) at a connection-element which can be plugged together with a bamboo culm (4), the cavity-joining holes (13) drilled into the connection-
15 element (1,14,21,34,38,52) are used as a tool-guiding.

27. Apparatus to produce a truss (5) from bar-elements (4,125,126), which are to be joined, and from connecting elements (1,14,21,34,38,52), which are to be placed between these bar-elements at all such joint places, where two or more
20 bar-elements meet whose longitudinal axes are not coaxial to each other, by carrying out the process according to one of the claims 14 through 26, characterised by at least one tool (56,113) designed as an ablating tool, in particular as a cutting tool, for machining at least one connecting element (1,14,21,34,38,52) made from a rigid, regenerative material and/or the ends
25 (73) of bar-elements (4,125,126) made from at least one segment of a material from high-growing plants each, which are to be mounted to said connecting element or to one another, in such a way that they obtain surfaces (10,11;75,76) which run along well-defined geometrical bodies at least in selected areas, whereby at the processed body (4,125,126;1,14,21,34,38,52) in the area of the joint of a bar-element (4,125,126) with a connecting element
30 (1,14,21,34,38) there is formed simultaneously a surface which runs along the lateral surface (11;76) of a cylinder, cone, prism or a pyramid at least in selected areas as well as a surface (11;75) which runs along a hollow cylinder,

hollow cone, hollow prism and or hollow pyramid at least in selected areas, respectively.

- 5 28. Apparatus according to claim 27, comprising at least one tool (113) for processing the ends (73) of a bar-element (4,125,126), characterised by a device (84) for clamping a bar-element (4,125,126) in such a way that both of its ends(73) are as parallel respectively concentric as possible aligned to a longitudinal axis of the processing apparatus (74).
- 10 29. Apparatus according to claim 28, characterised by a device (108) at each end of the clamping device (84) for holding and/or mounting of a processing-tool (113).
- 15 30. Apparatus according to one of the claims 27 through 29, characterised by a device (111) to guide the processing tools (113) or their holdings (108) respectively in the feeding direction along the longitudinal axis of the processing apparatus (74).
- 20 31. Apparatus according to one of the claims 27 through 30, characterised by at least one cutting tool in the shape of a milling head (113) for machining the lateral surfaces (73) at the ends of the bar-elements (4,125,126), which is designed to process the inner and the outer surface (75,76) of a bar-element (4,125,126), in particular a bamboo culm, simultaneously.
- 25 32. Apparatus according to claim 27, comprising at least one tool (56) for machining a connecting element (1,14,21,34,38,52), characterised by its design as a tool (56) rotating around an axis (57), with a cutting edge for creating a cavity (9) of rotational symmetry with defined cross-sectional area.
- 30 33. Apparatus according to claim 32, characterised in that the cutting region is arranged at a peripheral boundary surface (64) which surrounds a central guiding device (60).

FIG. 34

34. Apparatus according to claim 33, characterised in that the central guiding device (60) is designed as a drill, so that the guiding drill-hole (13) and the plugging cavity (9) can be produced in one work step.